FROM XYLOGRAPHS TO LEAD MOLDS

AD 1440-AD 1921

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FOREWORD

PRINTING has been called "the art preservative of all arts." The invention of individual movable cast-metal type, between A. D. 1440 and 1446, made printing a commercial possibility.

The subsequent rapid spread of the art, in the hands of students and craftsmen, may be said to have been the centrifugal force of the Renaissance and the Revival of Learning, which age, if it can be chronologically delimited, began A. D. 1453.

Printing divulged to the masses the ancient classics which had been locked up in monasteries and accessible only to clerics and the nobility. The common people began to read. Education became popularized.

This brochure is a brief history of the evolution from xylographs to the methods used today for duplicating a typographical printing surface in a solid piece.

INDIVIDUAL MOVABLE CAST-METAL TYPE

THE art of writing, and that of printing from wooden blocks, and all the subsidiary arts of illuminating, decorating and binding manuscripts and books, had long passed out of the exclusive hands of the monasteries into the hands of students and artisans, before printing with individual movable cast-metal type was invented. This epoch making invention came into practical use between A. D. 1440 and 1446.

When, therefore, Johannes Koelhoff of Lubeck, Germany, printed the "Cologne Chronicle" in 1499, he used individual movable cast-metal type. Typographic printing had long before superseded Xylographic printing, that is, printing from a solid block of wood on which type of an entire page were cut individually by hand.

Between the invention of individual movable cast-metal type and the perfection by the Earl of Stanhope of his printing-press, (a period of about three hundred and sixty years), very few improvements had been made in the mechanics of printing. Everything we know today about the art has come into use since 1799, and if Koelhoff had come to life in 1799 and been permitted to resume his occupation of printer, he would have found himself practically familiar with the mechanical equip-

ment of his craft as used in the establishment of the Stanhope Press in that last year of the eighteenth century.

Centuries before 1440 printing is believed to have been attempted in China; presumably about the beginning of the Christian era. It is said that in the year A. D. 175 the text of the Chinese classics was cut into tablets which were erected outside the national university at Peking, and that impressions—probably rubbings—were taken of them. Some of these fac-simile impressions are still in existence, it is asserted.

Xylography was also practiced in China long before Europe knew the art. It can be traced as far back as the sixth century, when the founder of the Suy dynasty is said to have had the remains of the Chinese classics engraved on wood, though it was not until the tenth century that printed books became common in China.

The authorities of the British Museum also report that Chinese writers give the name of a certain Pi Sheng who, in the eleventh century, invented movable type, and the Department of Oriental Printed Books and Manuscripts of the same institution possesses a copy of the Wen hsien tung Kao, a Chinese encyclopedia printed in Korea from movable type in A. D. 1337.

To the Koreans also is attributed the invention of copper type in the beginning of the 15th century, and the inspection of books bearing the dates of that period seems to show that they used such type, even if they did not invent them.

The first authentic European printing produced from individual movable type of which we have any recorded impression, bears the date of A. D. 1454. These documents are two different editions of the same Letters of Indulgence issued in that year by Pope Nicholas V. in

behalf of the Kingdom of Cyprus. We do not know, however, whether they were printed from metal or wood type.

As to the *exact* date of the invention of printing from individual movable type in Europe, we know only that

it was some time prior to A. D. 1454. Where and by whom the invention came about, a dispute has been waged for more than four hundred years; one of the most hotly contested questions in history. In short, Koelhoff was in part responsible for starting this dispute. He published in his "Cologne Chronicle" a statement by, Ulrich Zell, a printer of Mainz in Germany and a contemporary of Gutenberg, that Gutenberg *had improved,* but *not invented* the art, which he attributes to Coster of Haarlem, in the Netherlands, in the year 1440. Gutenberg stole Coster's type, according to Zell, and printed from them in 1442. Other unrefutable evidence shows that Gutenberg could not have begun printing at Mainz before the end of 1450.

In addition to Gutenberg and Coster we also find Waldfoghel of Avignon, in France, and Castaldi of Felte, in Italy, mentioned as claimants of this invention. The value of their respective pretensions has been summed up by one well known authority in the words, "Holland has books, but no documents. France has documents, but no books. Italy has neither books, nor documents, while Germany has both books and documents."

As the case stands at present, after careful and impartial examination of all available evidence, no choice is left but to attribute the invention of printing with individual movable cast-metal type to Lourens Janszoon Coster of Haarlem in the Netherlands between the years 1440 and 1446 and not to Gutenberg of Mainz in Germany.

Zell's statement in the "Cologne Chronicle" of 1499 is further substantiated by Hadrianus Junius in his "Batavia." Junius stated that printing from individual movable type was invented by Coster in Haarlem, and that the "Speculum Humanae Salvationes" was one of his first productions. These two statements were made independently of each other and both are corroborated by books to which they refer.

The "Speculum Humanae Salvationes," attributed to Coster by Junius was partly a folio Latin block-book, and partly typographically printed. From this and other records it has been clearly established that Coster began as a xylographer and ended as a typographical printer, and before 1472 he had manufactured and extensively used at least seven different styles of primitive looking individual movable cast-metal type.

According to tradition, while he was walking in a wood near Haarlem, Coster cut some letters in the bark of a beech tree, and with them, reversely impressed one by one on paper, he composed one or two lines as an example for the children of his son-in-law.

Junius does not say it, but clearly implies that, in this way, Coster came to the idea of the movability of the characters, the first step in the invention of typography. He perceived the advantage and utility of such insulated characters, which hitherto he had been cutting together

on one block, and so the invention of printing with individual movable type was made.

The questions as to whether he continued to print with movable "wooden" type, or even printed books with them, cannot be answered, because no such books or fragments of them have come down to us. Junius' words on this point are ambiguous, and yet, upon the examination of the first edition of the Dutch Spiegel (of which two copies are preserved at Haarlem) no one would deny that there are grounds for this belief. The dancing condition of the lines and letters make it almost impossible to think that they are impressions from metal type. But for how long and to what extent movable wooden type were employed, if at all, cannot be positively stated.

However, this idea of movability, and the accidental way in which it was discovered, form together the pith of the Haarlem tradition as told by Junius. Nothing seems more natural than that a block-printer should cut such separate letters as Coster did on the bark of a tree and thereupon perceive that they could be used over and over again for a variety of words on different pages, while those which he used to cut in a solid block only served him for one page and for one purpose.

It is equally clear from the Haarlem tradition that the art of casting metal type was the second stage in the invention, a development or outcome of the primary idea of "movable letters," for Junius says that Coster "afterwards changed the beechen characters into leaden, and the latter again into tin ones."

Theod. Bibliander, in 1548, was the first to speak of movable wooden type and to describe them. First they cut their letters, he reports, on wood blocks the size of

an entire page; but because the labor and cost of that way was so great, they devised movable wooden type, perforated and joined one to another by a thread.

Bibliander does not say that he had ever seen such type himself, but Dan Speckle or Specklin (d. 1589) who ascribed the invention to Mentelin, asserts that he saw some of these wooden type at Straussburg; and Angelo Roccho asserted in 1591 that he had seen at Venice type perforated and joined one to another by a thread, but he does not state whether they were of wood or of metal.

There is a theory also that between block-printing and printing with movable cast-metal type there was an intermediate stage of printing with "sculpto-fusi" type; that is, a type of which the shank had to be cast in a quadrilateral mold and the characters or letters engraved afterwards by hand. This theory was suggested by some one who could not believe in wooden type and yet wished to account for the marked irregularities of the type used to print the earliest books.

Granting that all the earlier works of typography preserved to us are impressions of cast-metal type, there are still differences of opinion, especially among practical printers and type-founders, as to the probable methods employed to cast them. It is considered unlikely, although not impossible, that the invention of printing passed all at once from xylography to the perfect typography of the punch, matrix, and mold.

The types that Coster made and used were supposed to have been manufactured in one of three or four probable ways.

Bernard believed that the first movable cast-metal type were molded in sand, since that method of casting was known to the silversmiths and trinket-makers of

the fifteenth century. In substantiation of his theory he exhibits a specimen of a word cast as a unit for him by this process, roughly similar to a modern linotype slug.

A second suggested mode was that of casting in clay molds, by a method very similar to that used in the sand process, and resulting in like peculiarities and variations in the type.

Ottley, in his "Invention of Printing," was the chief exponent of this theory. He believed that type were made by pouring molten lead into molds of clay or plaster, after the ordinary manner used from time immemorial in casting statues and other articles of metal.

The imperfections in the type cast by the sand and clay processes — the difficulty of uneven heights in the various type—is supposed to have been surmounted either by locking up the form with the type-face downward on the composing stone, or by perforating the type, either at the time of casting or afterwards, and holding them in their places by means of a wire or thread through the perforations.

To this cause has been attributed the numerous misprints in those early specimens of the printers' art, to correct which would have involved the unthreading of every line in which a typographical error occurred.

A striking proof that the lines were put into the form one by one, as a piece, instead of type by type, is shown in a blunder in the "Speculum" of Coster where the whole of a last reference line is "turned." It is as if a

modern linotype slug were put in the form up-side-down.

A third suggestion as to the method by which the type of those early days of printing may have been produced is described as a system that the type-founders of about 1800 called Polytypage, which is a cast facsimile copy of an engraved block of type matter. Lambinet, who is responsible for this suggestion, explains that this method really means an early adoption of the stereotyping process.

Lambinet thought that the early printers may have discovered a way of molding in cooling metal so as to get a matrix-plate impression of an entire page. Upon this matrix they would pour molten lead or tin and by the aid of a roller, press the fused metal evenly so as to make it penetrate into all the hollows and corners of the letters. This tablet of lead or tin, when cooled, being easily detached from the matrix, would then reveal the letters of the alphabet reversed and in relief, similar to a present day stereotype. The individual letters, of course, could easily be cut apart by a sharp tool, and the molding operation could be repeated, using the same matrix. The metal type faces so produced would be fixed on wooden shanks, type high, and the font would be complete.

It is impossible to suppose, however, that the Mainz psalter of 1457, which Lambinet points to as a specimen of this mode of execution, is the impression, not of type at all, but a collection of "casts" mounted on wood.

Yet another theory has been proposed by Dr. Ch. Enschede, head of the celebrated type foundry of that name in Haarlem. Enschede concludes that the Costerian type were produced from leaden matrices and the latter from brass patrices. Their bad, irregular condi-

tion was due to the tools being imperfect, and Coster in the first practice of his invention was inexperienced and therefore bound to produce such imperfections as are found in the Speculum. Coster's type were cast in one tempo, that is, the character itself and the shank cast at the same time in one piece.

Gutenberg's patrices, according to Enschede, were made like bookbinders' stamps, of yellow copper, i. e., brass. With such patrices only lead matrices could be made, but the latter could be produced in two ways. Molten lead could be poured over the patrices or the patrices could be pressed into cold lead. The first mode is somewhat complex, but the matrix would have a smooth surface and need no further adjustment.

The second mode is more simple, but required great force, although lead is a soft metal. Moreover the surface of the matrix would have to be trimmed, as the impression forces the metal downwards and sidewards, which makes the surface uneven, though by this pressure the lead becomes firmer and more compact, to the advantage of the type-founder.

Enschede thinks that Gutenberg obtained his matrices by the second mode. He arrives at this conclusion by reason of the fact that Gutenberg's types were sharper in their impressions than Coster's. Developing this theory, he believes that Gutenberg had each letter engraved on a brass plate 2 mm. thick, therefore a mere letter without anything underneath it. This brass letter patrix was pressed, by means of a small flat plate, so far into the lead that its back formed an unbroken plane with the top surface of the lead, and was then removed.

After the matrix had been made this way, the type were cast, which was done, not by pouring metal into

the matrix, but by pressing the latter into semi-fused metal. In this way a great many letters could be cast from one matrix without any injury to it. Gutenberg's method was to cast in two tempos, according to Enschede, that is, the character was cast first and the shank was cast by another operation joining it to the character.

Enschede warns us, however, that his theories are simply those of a practical founder and not a bibliographer's. But since no tools used by those early printers and type-founders have come to light to prove or disprove him, his theory is as valuable as any others advanced as to the methods used for casting type in those primitive days of printing.

The shape of the type used as early as 1470 does not seem to differ materially from those of the present day. This is evident from old type which were discovered in 1878 in the bed of the river Saone, near Lyons, opposite the site of one of the fifteenth century printing-houses of that city.

Also a page in Joh. Neider's "Lepra Moralis" printed by Conrad Homburch in Cologne in 1476 shows the accidental impression of a type pulled up from its place in the course of printing by the ink-ball, and laid at length on the face of the form, leaving its exact profile indented upon the page.

This accidental imprint shows a small circle, and it is presumed that the type were pierced latterly by a circular hole, which did not penetrate the whole thickness of the letter, and served, like the nick in modern type, to enable the compositor to tell by touch which way to set the letter in his stick.

The fact that a letter was pulled out of the form seems to show that the type composing the line could not have

been threaded together, as set forth by Ottley in his theory of clay molds for casting type. It is to be remembered, however, that in the early days of printing, every printer was his own type-founder. The method of casting type had not been standardized and each printer had his own individual ideas both as to the kind of characters and the method used in casting them. Some may have threaded their type together in lines and others may have simply locked them up in the form face downward in the composing stone to overcome any irregularities caused by crude methods of casting.

Vinc. Fineschi, of Florence, in Italy, gives an extract from the cost-book of the Ripoli press, about 1480, which shows that steel, brass, copper, tin, lead and iron were all used in the manufacture of type at that period.

Today we have the wizardry of mechanical production in the manufacture of type. The linotype and monotype machines, uncanny in their operations, have also come into common practice. Without them printing would seem almost as primitive, in typography, as it was in its infancy.

STEREOTYPING

ABOUT the beginning of the eighteenth century a certain Van der Meyer, of Antwerp, made the next step towards a definite improvement in typography, the first that had been attempted since the invention of printing from movable, cast-metal type. Van der Meyer prepared the composed pages of the Bible by soldering together the bottom of the type in the form. This was the first "stereotype," a term derived from two Greek words meaning literally "solidtype."

This method met one requirement. It prevented the "pi-ing" of the type, but it had the disadvantage of holding in comparative idleness a large and costly mass of type useless for any other purpose, and it was not generally practiced.

This was followed in 1730, by William Ged, a goldsmith of Edinburgh, who is credited with casting printing-plates in plaster-of-paris molds for the University of Cambridge Bible. These plates, however, were destroyed by jealous printers and thrown aside, resulting in the process being abandoned for many years.

In the meantime several other improvements along this line were undergoing experiment. Firmin Didot, (1764-1836), a printer of Paris, cast type of a hard

alloy, and when his book-pages were composed, made an impression of them on a sheet of soft lead, thus forming a mold. Molten metal was then poured into a shallow tray, and just as this was on the point of solidifying, but still plastic, the lead-mold of the book-page was pressed on the soft metal in the tray. This process called Polytypage, was but partly successful; it could be used only for small pages, and the plates were too often defective. A process similar to this is what Lambinet thought the printers of the latter half of the fifteenth century might have used as one of the probable methods to cast their metal types.

These and other experiments, however, were leading to the real stereotyping process which developed later.

Early in the nineteenth century, Earl Stanhope, of England, re-introduced Ged's stereotyping process with many improvements.

One or more pages of type were locked in a chase, the surface of the type being oiled to prevent the subsequent mold from sticking. The mold was made by pouring a semi-fluid composition of plaster-of-paris mixed with a little fine salt to make the plaster settle solidly. While the plaster was still soft, it was carefully pressed down and rolled smooth on top to give a uniform thickness to the mold and to expel any air there might be in the plaster. When the plaster became solid, it formed a perfect matrix of the type pages.

The moisture in those early plaster molds was expelled by baking them in an oven for three or four hours. A later method for drying was practiced by suspending the mold directly over the metal-pots or to float them on the surface of the molten metal. By this

means the drying could be accomplished in a half-hour or so.

In the process of casting, several of these plaster molds were placed side by side face downward in a special casting-pan. The pan was one and three-quarters or two inches deep, and a lid on the pan screwed down on the back of the molds. By means of a crane the casting pan with its molds was then lowered into the pot of molten metal which ran into the pan at the corners and sides. The mold was allowed to remain ten minutes or so in the metal-pot, or until the face of the inverted mold was entirely filled with the metal.

A later method of casting from a plaster mold was to place it in a frame with a smooth, flat plate opposite the face of the mold and to enclose the open space at one end and on the two sides. The casting space thus formed was then turned with the open end up and metal was poured in with a ladle, in a manner similar to the method still employed for casting job-work stereotypes. The distance between the flat plate and the mold was adjusted to make a stereotype plate of the required thickness.

After the removal and cooling of the casting pan, the plates were freed from the plaster and the surplus metal cut off. Only one cast could be made, as the mold was usually destroyed in removing the cast. The stereotype was then sent to the finishing department, where the

face was cleaned and examined for defective letters, then trimmed on the sides and planed off uniformly on the back to the desired thickness, in the same manner as a stereotype is treated today. A defective letter could be mortised out of the plate and a good type inserted in its place. In cases where a whole line or other part was imperfect, another mold was made of as much of the form as was necessary and the new cast inserted and soldered to the plate.

There were many and varied experiments made in the earlier development of this idea of producing a duplicate printing form in a single piece. That such a process was highly desirable was universally recognized, and the conviction that some practicable and economical method was feasible was a continual incentive which gradually led to better results.

STEREOTYPING IN AMERICA

ALTHOUGH credit is given to John Watts, an Englishman then working in America, for making the first stereotype plates here, the real introduction of the process into the United States was by David Bruce. This was in 1813. Bruce had learned the printer's trade in Edinburgh and later came to America, where after a few years he was joined by his brother George in establishing the firm of D. & G. Bruce, printers. Hearing of the new process of stereotyping in England, he went over there to learn about it.

He could get very little information about the process there, but came back with some practical ideas which he proceeded to carry out. Bruce and his brother also began type-founding about this time, and abandoned the business of printing. Later they gave up the work of stereotyping.

The first book stereotyped in the United States was the New Testament, in 1814. Bibles and school books were the first works to be stereotyped; then came other books which were demanded in many editions, such as the works of popular authors.

THE PAPIER MACHE MATRIX

THE papier-mache (literally, mashed paper) matrix was first successfully used for casting stereotypes for book pages in France in 1848. Charles Craske, an engraver of New York, introduced the method into the stereotype trade of the United States in 1850, and in 1854 he stereotyped a page of the *"New York Herald"* and later made stereotypes for other New York newspapers.

The modern wet stereotype "flong," in common use today, consists of several layers of special paper pasted together to form a thick sheet. The base is a sheet of special soft stock similar to firm blotting-paper, such as is used between leaves of small blank books. Three or four sheets of strong, white tissue are next added, each sheet except the last being uniformly covered with the paste. The pasting must be done with great care so as to cover the entire surface of each sheet and at the same time to press out all air bubbles. The sheets must then be pressed smoothly but not squeezed so hard as to force the paste out and must be kept moist until used. In newspaper syndicate plants, the "flong" is made automatically by a specially devised machine into which the various kinds of paper used are fed from rolls, the pasting and cutting into sheets being mechanical.

In molding a papier-mache matrix, the moist "flong" is laid on the original molding form to be duplicated, the molding form being in place on the table of the molding press. The "flong" is covered with several blankets of thick felt and the table of the molding press

is then automatically moved in under a powerful roller which squeezes the moist flong down into the form. At the end of its travel the table is automatically brought back again under the rollers to the position from which it started. The speed of the roller and the table is synchronized to obviate any possibility of the mat becoming wrinkled by sliding.

The molded matrix and the pattern with the blanket still on it is then transferred to the drying press, in which under a hot platten it is again squeezed and allowed to remain for a few minutes until the moisture is completely expelled from the molded flong. The drying press is kept at a high temperature, usually by steam heat.

The matrix thus dried out to a thick, flexible cardboard is then ready for the casting of the stereotype, which is done by pouring molten stereotype metal against the face of the matrix placed in a casting-box designed for this purpose. A successive number of stereotypes can be cast for the same mat before it is injured by the hot metal. For job-work stereotyping the casting-box is flat, and the molten metal is either poured by hand or automatically pumped in the casting-box.

After the stereotype is cast it is flattened, rough shaved, smooth shaved, bevelled or blocked on wood; the wood base trimmed and then planed type-high for printing press use.

The large daily papers cast the full-page stereotype from which the paper is printed in an automatic casting machine which forms a curved plate, trimmed and bevelled, to fit the cylinder of the press.

Stereotyping was for many years the chief means of making plates for books and also for commercial printing.

It has several advantages. The first, obviously, is the advantage which it shares with several other methods of providing a solid printing plate made by molding from an original form of type or engraving. Its peculiar advantage, however, is that it is the quickest method of producing a duplicate plate from an original.

In comparison with electrotyping, however, it has two distinct disadvantages. One is that it is not adapted for reproducing the fine lines of engravings and type faces. In addition it is comparatively shallow and does not possess a sharp, clean printing face. The other disadvantage is that a stereotype is relatively soft and quickly worn.

Stereotypes have been made more durable, to withstand the wear of printing, by the deposition of a film of harder metal—copper or nickel—on the face of the plate after it has been cast. This, however, is not satisfactory, as it involves not only another operation, but also makes an already shallow printing plate that much shallower and increases the probability of it printing "dirty," which is one of the chief objections to the stereotype in itself. This practice is not recommended.

ELECTROTYPING

IN 1799, Allesandro Volta, of Pavia, in Italy, constructed the first electric battery, which came to be called the Voltaic pile. Improvements in the form of Volta's battery were made almost immediately by William Cruickshank, in England, who discovered in experimenting with it that he could by its power electrolyze or chemically decompose the salts of certain metals in solution. Both copper and silver, he found, could be precipitated from their salt solutions and deposited upon a plate immersed in the solution.

This observation was the first step in the process of electroplating, which is electrotyping when applied to the art of typography.

In 1837, thirty-eight years after Volta's discovery, Mr. Thomas Spencer of Liverpool, England, accidentally stumbled upon the first realization of the electrotyping process.

While experimenting with a modification of a Daniell battery, he used an English copper penny as one of the poles instead of a plain piece of copper. A deposition of copper from the solution in the battery took place upon the penny, and upon removing the wire which attached

the penny to the zinc plate a portion of the copper deposit was pulled off the penny also.

This first copper electrotype shell Spencer found to be an exact duplicate or mold of part of the head and lettering on the coin. *It was as smooth and as sharp as the original.*

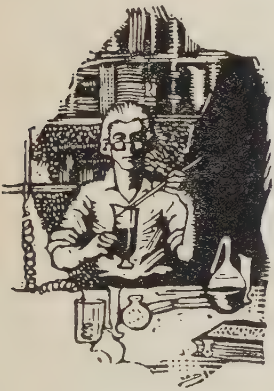
It was some time later, however, before this suggested to him any useful application of the process. Another accident made him appreciate the full value of his discovery. This time he carelessly dropped some varnish on a strip of copper which he was going to use in the same way he did the penny. Upon removing the copper from the battery he observed that there was no deposition of copper on those parts of the strip where the varnish had dropped.

Spencer then conceived the idea of applying this principle to the arts by coating a piece of copper with varnish or wax and engraving a design in the coating, thus exposing the copper strip in the engraved lines. He did this, and then deposited copper in the design so engraved. Upon removing the coating the design was exposed in relief on the piece of copper.

On September 13, 1839, Spencer read a paper before the Polytechnic Institution of Liverpool, which he accompanied with specimens of both electrotypes made by this process and of printing from these electrotypes. The publication of this paper acted like an electric shock upon society.

Developing his process, Spencer first used lead as the plastic medium in which to mold printing surfaces, and it is to be noted in this connection that in doing so he anticipated Dr. Albert's lead mold by considerably over three quarters of a century.

Spencer impressed a form of type on a planed piece of sheet-lead and subjected both of them to the action of a screw-press. A perfectly sharp mold of the type form was thus made in the lead. This lead mold was placed in a battery, and at the end of *eight days* a copper shell one eighth of an inch in thickness had been deposited. It was then removed from the apparatus and the rough edge of the deposited copper filed off. Being subjected to heat, the copper shell loosened from the lead-mold. Spencer called this a "copper stereotype."



The next step in developing the electrotyping process, after Spencer had demonstrated the practical application of the electro-chemical deposition of a copper shell on a mold, was made by a Mr. Robert Murray. Mr. Murray was the first to use plumbago, or black-lead, to give the surface of non-metallic bodies electro-conductive properties. He discovered that he could coat a mold of bees-wax with black-lead and deposit thereon a copper shell. This was in 1840.

In the same year Smee's battery was invented. This was a marked improvement and was a most important step towards making electrotyping a commercial possibility.

Thus in 1840, four hundred years after the probable date of the invention of printing from individual movable cast-metal type, and over forty years after

the foundation of electrotyping was laid by Volta, electrotyping, as a practical method of reproducing a commercial typographical printing surface, came into existence.

Mr. E. Palmer, in England, using Spencer's method, was the first to receive a patent for producing a metallic printing plate with the printing surfaces in relief. This patent is dated 1841. Palmer followed this in the succeeding year by a further patent for engraving through a wax-coated matrix-plate to form the printing surfaces in the *positive* electrotype taken from it. This process was termed by Palmer, "Glyphography."

The "whites" or low spots in Palmer's Glyphographs were "built-up" in the wax mold through adding wax by hand, assisted by various ingeniously constructed tools which were heated. After "building-up," the wax was black-leaded and the copper deposition on the surface of the wax mold was obtained. This copper deposit, or shell, was then tinned on the back, backed up with lead, mounted on wood, and trimmed type-high. These processes are the essentials used today in electrotyping.

One of the earliest works illustrated by the Palmer process is "The History and Antiquities of Brentford, Ealing, and Chiswick," by T. Faulkner, published in 1845, and the word "Glyphography" occurs at the foot of many illustrations contained in it.

In 1839 the first attempt was made at commercial electrotyping in America. In that year, Joseph A. Adams, a wood-engraver connected with Harper & Bros. in New York, experimented along lines similar to those Spencer had pursued, but using a wood-cut from which to mold. His electrotypes were made by taking an im-

pression from the wood-cut in an alloy of soft metal of which bismuth was probably the chief ingredient, and immersing the metal mold in an ordinary Voltaic battery for the deposition of the copper shell. In making the impression, however, the wood-cut was destroyed so, that this method of making an electrotype was not commercially practical.

The year following Adams took advantage of Smee's battery and made an electrotype which was used in Mape's Magazine in 1841. He also employed this process for making illustrations for Harper's Family Bible, issued between 1842 and 1844.

The first successful commercial electrotyper in America was John W. Wilcox, of Boston. A wood carver named Chandler, told Mr. Wilcox that if he could repeat what Adams of New York had done with a wood-cut in 1839 that he, Chandler, would lend him the necessary wood-cuts for experimental purposes. In less than sixty days in 1846, Mr. Wilcox had put into practical use every essential principle known for the next twenty-five years in electrotyping.

In 1855, Mr. Gay of New York first used tin-foil for the purpose of soldering the copper shells to the metal backing.

During the same year, a Mr. Adams of Brooklyn, New York, invented the dry-brush black-leading machine.

Steven D. Tucker, of New York, developed and

patented in 1866 the type of dry-brush black-leading machine which is in common use today.

In 1871, Silas P. Knight, of Harper & Bros., New York, invented the wet black-leading process, and in 1872 took out another patent for an improvement on this process. Mr. Knight's method of wet black-leading was not generally adopted by the electrotypers of that time and gradually became almost unknown.

Undoubtedly, the cause of this was that the method of dry black-leading was good enough for type and wood-cut work. The half-tone had not been invented at that time, and it was only after the invention of the half-tone that a better method of black-leading became necessary.

Thirty-seven years after Mr. Knight had successfully used his process of wet black-leading a patent was granted to Frank L. Learman, of Buffalo, New York, for a wet black-leader. Since that time numerous patents have been taken out on different methods of using the wet process, which is universally recognized today as the best method of graphiting the surface of a mold.

In 1870, Joseph A. Adams patented a process for covering the surface of the mold after it had been black-leaded with powdered tin. This was for the purpose of quickening the deposition of the copper shell when the molds were in the batteries, and from this undoubtedly came the oxidizing process of coating the surface of the molds with chemical copper invented by Silas Knight, which has long been and is now in use.

Perhaps one of the greatest forward steps in the development of electrotyping was made when the plating dynamo was invented. The first adoption of a dynamo in place of Smee's battery took place in 1872. With the Smee type of battery it required from thirty to forty-

eight hours to deposit a copper shell thick enough for commercial use. With the invention of the plating dynamo and its improvements, the time of depositing the shell was reduced so that now two hours is the common time that a mold is kept in the tubs or batteries. This quickening of the time required to deposit the shell was one of the most essential features in the development of commercial electrotyping.

From the first hand-screw presses, which were successfully used for molding, to the modern high-power, motor-driven, hydraulic presses, for working either in wax or lead, is a far cry.

The invention of the half-tone, together with the invention of the modern two-revolution cylinder press which has brought printing into its present state of perfection, made necessary radical improvements in the machinery for making electrotypes. These improvements have been steady in their development, but the fundamental points of the process are practically those which have been in use from the start of commercial electrotyping.

ELECTROTYPING BY THE WAX MOLD PROCESS

AN ELECTROTYPE is a facsimile printing plate duplicated from an original. The original may be either type, a woodcut, a zinc or a copper etching such as a line-cut or a half-tone, or it may be a combination of type-matter and line-cuts or half-tones.

We commonly think of electrotypes as printing plates made of copper, but any metal which can be electro-chemically deposited may be used. Because of their wearing qualities and economy, however, copper and nickel are the two metals commercially used for electrotyping.

Briefly, an electrotype is made by taking an impression of the original in a plastic substance, thus forming a mold or matrix; depositing copper or nickel on the mold; removing the copper or nickel shell from the mold and backing it with a semi-hard metal; trimming the metal to printing-plate thickness, and bevelling, or blocking on wood, the trimmed plate for printing-press use.

In modern practice more than twenty-five different operations are necessary to make a finished electrotype ready for the press. They may be enumerated, as follows:

1. Case-making. The flowing of a molding compound composed of "ozokerite," a resinol-mineral wax, onto the case. The case is of copper.

2. Flashing the Case. Passing a flame over the

surface of the melted ozokerite immediately after flowing the case in order to remove air-bubbles.

3. *Case-shaving.* The automatic shaving of the top surface of the flowed case after the ozokerite has hardened to give it a smooth, even surface for molding.

4. *Graphiting.* Brushing surface of case with molding graphite to prevent the pattern from sticking to the wax mold.

5. *Molding.* Making an impression from the original zinc line etching, half-tone or type form in the waxed case. This is done by means of a hydraulically operated molding press.

6. *Cutting-down.* The levelling off by hand, using a sharp trowel shaped tool, of the splurge after the impression has been made. Flashing is also used here to remove the burr left around the letters after the cutting down process.

7. *Building-up.* The adding of wax by hand to the blank spaces in the molded case so that in the finished electrotype they will be well below the printing face.

8. *Black-leading.* Making the face of the molded case electrically conductive by applying graphite.

9. *Stopping-out.* Insulating with a thin coating of wax the edges and back of the copper case to prevent copper being deposited except on the face of the mold.

10. *Pumping-out or Oxidizing.* Coating the face of the molded case with chemical copper to hasten deposition of copper shell in the bath.

11. *Deposition of Shell.* The molded case is put in the electrolytic bath for the deposition of shell thereon.

12. *Releasing Shell from Molds.* Stripping the deposited shell from the waxed mold by dashing hot

water on it. The wax is melted off case and used again.

13. Washing Copper Shell. Hot lye-water or steam is used to clean off any wax sticking to it.

14. Trimming Copper Shell. Rough edges of shell outside the guard line trimmed off.

15. Aciding Copper Shell. An application of fluxing medium to back of copper shell so that tin will adhere.

16. Tinning Copper Shell. Tin-foil is melted on the back of the copper shell. This is the solder between the copper shell and the metal back, without which the metal backing would not adhere to the shell.

17. Backing-up. The flowing of electrotype metal on the back of the tinned copper shell for the purpose of making a foundation for printing (electrotype metal is an alloy of 94 per cent lead; 3 per cent tin for flowing and 3 per cent antimony for hardness).

18. Scrubbing the Cast. A power operated scrubbing machine using a hydro-carbon oil as the cleansing medium to clean the printing face of the electrotypes.

19. Cast-sawing. Sawing off the surplus metal of the cast before finishing.

20. Flattening the Casts. Hand operation with mallet and flattening block to take the warp out of the electrotype caused by the contraction of the metal in cooling.

21. Rough-shaving. Planing off superfluous metal from the back of the electrotype.

22. Finishing. Putting the printing surface of the electrotype in perfect condition for press after leaving the foundry department. This is done by hand and requires a high degree of skill.

23. Smooth-shaving. The finishing shave of metal from back of electrotype to bring it to the required thickness.

24. Routing. Cutting out the high but non-printing surfaces of the electrotype by a routing machine.

25. Guard-line Sawing. Cutting the guard lines or bearers off the electrotype to practically the finished size before blocking or bevelling.

26. Blocking. Fastening the plate on wood base with brads driven through the metal.

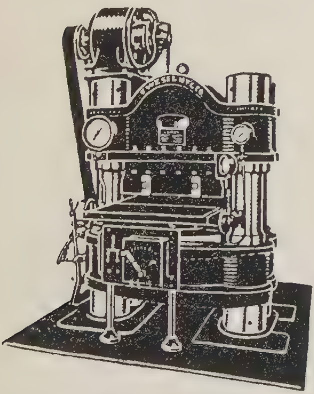
27. Trimming. Trimming the wood mounted electrotype to its exact finished size.

28. Type-high Machining. Used for planing the bottom of the wood base so that the mounted electrotype is of printing press requirements, i. e., .918″ high.

ELECTROTYPING BY THE LEAD MOLD PROCESS

ELECTROTYPES made by the genuine Dr. Albert Lead Mold Process are always duplicates of fine-screen half-tones or mezzo-tints used for the highest class of commercial job-work, such as three and four color process or duo-tone printing on paper with a highly glazed surface.

The largest press used in lead molding will give a maximum pressure of two thousand tons per square inch on a thirty inch ram hydraulically operated. The weight of this press is over thirty thousand pounds.



In the lead mold process the plastic medium used is a soft thin sheet of what is called "impression lead," .040 inches thick, instead of wax, and the lead is placed on top of the original to be duplicated, instead of vice-versa, as in the wax-molding process. No "building-up" nor "black-leading" is necessary.

In all other respects the consecutive steps towards the completion of the lead mold plate are identical to those used in the Wax Mold Process.

ALUMINOTYPES

THE age long progress in the development and perfection of typographical printing surfaces, from the period of Xylographic blocks on through the successive inventions of individual movable cast-metal type, stereotyping and electrotyping, by both the wax and lead-molding processes, reaches its culmination in *Aluminotypes*.

Briefly, it is a method of casting printing plates of aluminum alloy in molds made from a composition of plaster-of-paris. In its essential points it is a modern adaptation of the process credited to William Ged of Edinburgh in 1730 and afterwards modified and improved in the early 19th century by Earl Stanhope of England.

In practice, the original to be duplicated is placed on a molding-slab. A molding frame is set upon the slab and enclosing the original. A special kind of oil is then sprayed on the face of the original. This is to facilitate the release of the plaster mold so that it will not "tear" when it is ready to be lifted off the original after solidifying, and at the same time to retain the sharpness of the mold.

The molding medium of plaster composition in a semi-liquefied state is then poured on to the original in the molding frame. The surplus plaster is scraped off flush with the top of the molding frame.

After the plaster matrix in its molding frame has set sufficiently it is released by means of cams from the working pattern on the molding-slab.

The plaster matrix is then placed in a drying oven, through which a forced draft of hot air is kept circulating at high pressure. The thorough drying of the mold takes approximately ninety minutes.

When the plaster mold has become sufficiently dried, a round hole is cut through the bottom of the matrix in an offset of the molding frame. This hole is the gate through which the molten aluminum is forced. The mold is then securely locked upright in a specially designed casting machine.

The Aluminotype is cast by pressure and not by pouring as in the case of stereotypes, which depend entirely upon gravity. Fused aluminum alloy is poured into a hopper on the casting machine. A piston operated by the agency of compressed air forces the aluminum evenly into all parts of the plaster matrix.

When the cast is completed the molding frame is taken from the casting machine and the Aluminotype removed from its plaster-of-paris matrix.

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The Rapid Electrotype Company.

THE MAKING OF THE FOOLPROOF NEWSPAPER DRAWING

SOME ADVERTISING PICTURES PRINT WELL—OTHERS DO NOT. WHY? IT'S ALL A MATTER OF GOING ABOUT IT IN A KNOW-HOW WAY

By J. LIVINGSTON LARNED

AN advertiser—perhaps one of the largest users of newspaper space in the country—sprang a surprise recently on his ad-manager. Into the office he came, one day, grim-visaged, jaw set, fire in his eyes, and armed with no less than fifty clippings from exchanges.

And on the amazed ad-manager's desk he placed two conglomerate piles of advertising matter. One represented the national newspaper campaign of his own industry; the other a collection of newspaper advertisements, picked at random.

"I think I have conclusive proof," said he, in no mild mood, "that you fellows are not as efficient as you might be. Here are our advertisements—from papers everywhere. The illustrations print abominably! Look at them. The matter has been called to my attention many times—by the newspapers themselves, by our road representatives and by local dealers. They say our electro service and our straight national campaigns

are all muddied up with pictures that nobody can decipher. Here's conclusive proof of it. Not a clean-looking cut in the series and you can't blame it on paper and press work and all that—they're *all* bad!"

The advertising manager glanced casually at the exhibits. The criticism was valid. Here was a daily newspaper campaign, running into space valued at approximately sixty thousand dollars, and the displays, three-fourths illustration, were mussy, involved, smeared up, and unsatisfactory from a reproductive standpoint. Solid black backgrounds were a sickly, washed-out gray and in other places intricate pen work had "run-together."

It was equally true that clippings of competitive advertising and advertising in general, selected at random, were strangely clean-cut. The comparison was startling.

"Mr. X," finally observed the ad-manager, "I see what you mean; all of us in this department have known of it, kept track of it; and the remarkable part of the entire situation is that these results can be traced back to you and your personal insistence on a certain type of pen and ink design, executed in a specific technique. These matters came up for your supervision and O. K. You did not care for the bold, simple outline drawings first submitted. You preferred too many, and a glut of detail. All of which is not compatible with newspaper printing, even in large space. We were afraid of this and said so at the time. Our objection was overruled. It's one thing to prefer a pleasing, perhaps highly artistic pen technique and quite another to apply it to fast presses, poor ink and hurried make-ready. A great many things can happen, and *do* happen, to a newspaper design before it is printed and in the readers' hands."

DISREGARDING FUNDAMENTALS

Sometimes it is better to come out with the frank, brutal truth. In a great many instances, poor newspaper reproduction is the direct result of some executive's marked preference for a certain artist or a certain technique, regardless of whether the man is qualified to draw for this field, or whether the technique is fitted for the purpose.

On the other hand, there is, unquestionably, a strange, well nigh inexcusable disregard of certain fundamentals of the business. There is too much swivel-chair composure; too much beatific reassurance, when proofs are submitted on good paper, from a flat-bed engraver-house press. A newspaper series is very apt to look 100 per cent when presented on the final electro sheet, or bound into a neat booklet for the dealer and printed on coated stock. These are ostrich methods!

In certain advertising agencies there is a standing rule in the matter of newspaper plates that all proofs must be pulled on newspaper stock—and a very inferior grade. A newspaper press is used, an entire series coming off at once. There is no make-ready to speak of.

By this process no one is deceived. You see exactly what will happen, or nearly so, when the series fares forth to newspapers all over the country.

The executive mentioned above had collected newspapers, big and little, from the four points of the compass. And he had collected a liberal number of perfectly satisfactory newspaper advertisements of the illustrated variety. Blacks were clean black, Ben Day tints held their own, there was no congestion, no smudging, no mishap of any sort.

If certain rules are followed, any newspaper advertising

illustration can be made "fool-proof." You can be absolutely certain of a printable result, despite all exigencies, all drawbacks, all hazards.

Failure usually follows a desire to attempt something beyond that which has been tried and is wholly practical. For the present, at least, users of newspaper space *must* bow to the inevitable. They *must* realize that there is a well-defined limit to what can be done mechanically. They must *not* defiantly experiment, although the desire to "do something new" and to be original is entirely praiseworthy.

THINGS YOU CAN'T DO

If you use half-tones, have them made very coarse screen—nothing finer than 60 line. Stop out whites and eliminate backgrounds. The high-light half-tone is a modern development with many virtues. If a portrait is used, take out all background.

There is a way of retouching photographs that will minimize the danger of poor printing. The artist strengthens weak contrasts, not with a brush and paint, but with a pen and waterproof black ink. He also uses areas of pure white. Successful reproduction is dependent upon *sharp,* clear, vigorous *contrasts.*

Stippling is one of the best substitutes for the half-tone. This simply means dotting-in a subject. It is a time-consuming, laborious process, but it means line plates and the elimination of middle tones—which are disastrous.

There was a time when certain clever inventions of the paper manufacturer could be employed for half-tone effects in line. For example, a Ross Board is manufactured with an assortment of patterned surfaces. When brush or crayon or pencil is drawn over them,

they give effects that may not be duplicated in straight pen and ink on plain white drawing board. Some of these papers have a chalk surface. Some have imitation half-tone patterns, straight-line designs, etc. It is possible to scratch away certain portions with a sharp knife. *Do not use them* as matters now stand in newspaper printing. They will not "stand reduction" and only very coarse tints reproduce satisfactorily.

Special Caution—Do not allow artists to make original drawings for newspaper use much larger than twice the size. Here is one of the greatest evils of the day. The artist seems possessed to make his original on a full sheet of paper, when he knows that the plate is for two or three newspaper columns. What happens? An illustration which makes a handsome showing in the original will inevitably fill-in when reduced to "actual size." Figure it out yourself—look at it through a reducing glass. Lines that seem wide apart almost touch in the congestion that follows great reduction. The really wise and shrewd artist makes his newspaper drawing *actual* size.

Not more than a dozen Ben Day patterns can be used safely—now—in newspapers. Do you know the meaning of "Ben Day?" It is a mechanical tint, printed mechanically either on the plate, by the engraver, or on the original drawing, from an inked gelatine surface and rubbed on with a stilus. Magazine reproduction accepts it in all its forms. Newspaper stock muddies it up when it is too fine. In any event, when selecting a pattern, see that it is an open one and have it put on the engraving —not the design. If on the design it means a reduction. If on the plate it means no reduction, but precisely as shown in the Ben Day book of patterns.

Avoid complex line treatments and techniques, such as cross-hatching and the laying in of many very fine 290 pen lines close together. They look well in the original—they seldom print well on newspaper stock. They reduce abominably.

Any newspaper illustration should have plenty of white margin to "relieve it." When a drawing is cramped, packed in, suffocated by side rules, borders and text, it suffers.

Clear outline drawings, with an occasional dash of black, prove most efficient for newspaper reproduction. They *can't* fill in, they *can't* smudge, they *can't* become contaminated by clots of printing ink or defects in the newspaper stock. Not even fast press work can damage their printability. But remember, not all outline drawings are alike—great originality of technique can be secured.

CAREFUL OF BLACK AREAS

Large areas of solid black are not advisable. Think it over. Ink flows irregularly on newspaper presses. One copy may show up exactly as in the original; the next may develop a white halo, a gray tendency, a smeary, half-baked look. No two impressions will be quite the same. And it is logical to see that this is apt to be so. Any imperfection or irregularity in the ink roller will cause it, or the collection of foreign matter on cut or roller. Any black area larger than two inches square is a hazard.

Advertisers often think that masses of solid black will make an advertisement "stand out." They would if they printed a smooth, even black—which they seldom do. But liberal white margins are far more potent in

attracting attention and in segregating an advertisement from mixed company than solid blacks.

The *appearance* of large areas of black may be secured via subterfuge. One method is to form the background of heavy black lines, quite close together. The white spaces between save the printing. Look at straight type through a magnifying glass. Not even type is printed clear black. Then what chance would an even surface of large proportion have?

Newspaper cuts should be "routed deep." Routing is merely the deepening or entire cutting away of extraneous matter on the engraving—that is, where there is no printing surface. The smudges of hideous design often seen are really an impression of a metal surface that has not been routed out properly. Every engraving should be examined critically for such defects.

Avoid placing a shaded area against a black area. As we have intimated, the heart and soul of the successful newspaper drawing is *contrast*.

The beginning of every advertisement or series of advertisements is represented in terms of a first visualization. It is in pencil. These should be made same size—that is, the actual size they are to eventually appear. Then no one, the artist least of all, is fooled by disparity of proportions.

KEEP IT SIMPLE

The visualizer should keep one cardinal point in mind. Keep newspaper advertisements simple. The less there is in them the better. Thirty-two of the ads selected by our advertising friend, mentioned earlier in the story, were good because they were simple. Type was held to blocks, and with as little change in style, size and character of type as possible.

All of them were characterized by liberal white margins. It is the best known way of fighting back the opposition of the surrounding appeals on the same page.

There's a good test possible. Make a photographic print of your advertisement, the size it is to appear, and paste it on a newspaper page—not a New York or Chicago paper, but a page in the "Bingville Banner."

Before plates are made or even before pen and ink drawings are fully completed, you can change, rearrange, eliminate, or add to, as the case may be.

The wise advertiser is the one who in preparing an elaborate and extensive newspaper campaign keys it in its printing qualities, not to the best papers on the list, but to the ones that are worst printed. This may mean the undreamed of thing of 100 per cent perfect!

No advertiser can hope to secure full efficiency from a campaign if it presents a smudged and confused appearance. Newspapers are trig things in their own right. Their column rules and their precision of type make this an arbitrary condition. There is really nothing finer and cleaner and more pleasing to the human eye than a well-composed newspaper, hot from the press. Ugly advertisements can make an ugly newspaper. They can even spoil the set-up and typography in general of the reading sections.

A newspaper is held responsible if returns from a single advertisement or a campaign are not satisfactory. It is looked upon as a "poor medium." Yet how many times the true fault can be traced to the message itself. Full efficiency in advertising is the result of full efficiency in the copy * * *.

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NEWSPAPER ADVERTISING PLATES

MECHANICAL production of any kind is an unsympathetic and inexorable thing, and the modern large daily newspaper, in its mechanical production, is unsympathetic and inexorable to the highest degree. It reproduces exactly and impartially from all the different material supplied to it.

Your ad-plate is locked into the form with the other matter composing the page. A hurried lock-up, and the form is molded into a mat and stereotyped. Fast presses and cheap ink do the rest.

If your ad does not show up well in the first few impressions run off, the press grinds on just the same, with little or no make-ready. Once they start, it is too late to stop to allow the press-room foreman to investigate why a certain ad. does not print up well. The "Daily Bugle" must get on the streets, if possible, before its competitors with the important scoop that the Beghum of Swat has just died. If you have supplied the best material for the newspapers to work with, the clean-cut reproduction of your advertisement is insured. If you have been penny-wise and pound-foolish in saving a few cents on your ad-plate, all the dollars you spent on art, typography and white space for your ad are on the knees of the gods and liable to be spilled off the said

knees, and your ad is messy looking when it appears. The advertiser invariably blames the newspaper and the newspaper passes the buck on to the plate-maker. The printed appearance of the ad is largely determined by the kind of plate furnished to the newspaper.

The large daily newspapers are entirely dependent upon the stereotyping process for the necessary speed required in production. They do not print directly from type or cuts. The big advantage of stereotyping in this connection lies in the fact that it is the quickest method of producing a solid, duplicate printing plate from an original molding form. After locking up a page form, it can be molded, the matrix dried and the plate cast and ready for the press in about ten minutes.

Therefore, only unmounted plates should be sent to the large daily papers and not wood mounted, as it takes too long for the heat to pass through the wood base in drying the mat.

The unmounted plate is placed on a metal base, (because heat passes through metal quickly in drying the mat) and then locked in the form with the type and other matter composing the entire page. A mat is then molded from the complete form and a curved stereotype is cast from this page mat. It is from this curved full page stereotype that the large daily newspaper is actually printed.

Since they must duplicate the plates sent to them by the stereotyping process, your expensively prepared advertisement, if it is to appear sharp and clean in the valuable space it uses, should be electrotyped by your plate-maker. A stereotype duplicated from an electrotype will print cleaner than a stereotype duplicated from a stereotype by reason of the fact that mats molded by

the newspaper from electrotypes are sharper and deeper than when they are molded from stereotypes.

Electrotypes have a distinctly sharper and harder face and are deeper than stereotypes. The very nature of the process and materials used in their manufacture makes this superiority inevitable. Wax is used as the plastic medium in which to mold electrotypes, whereas for stereotypes paper is used. Sharpness and depth cannot be molded into paper as it can into wax.

Neither will stereotype metal poured by gravity against a paper matrix mold be as sharp and deep as copper deposited electrolytically on a wax mold.

It follows, therefore, that when an unmounted electrotype is supplied to the "Chicago Tribune" or the "New York Journal" or the "San Francisco Call" they are stereotyping your ad in the page form from a plate molded in wax directly from the original.

On the other hand, when you supply a stereotype of your ad to the large dailies this stereotype is already one step removed from the original master plate and means that two paper mats intervene between the original supplied to the plate-maker and the final stereotype of the page containing your advertisement. In short, they are duplicating a stereotype from a stereotype and each duplication means a loss in sharpness and depth; therefore they should be supplied with a sharp electrotype from which to make their final page mat.

Obviously when a stereotype is supplied to the large dailies they are working from a plate that is neither sharp nor deep to start with, as would be the case if you sent them an electrotype from which to work. An electrotype is economy in the end and will save you grief, when the cost of space is considered.

Should you desire economy, order your plate-maker to send mats—copy considered—to the large dailies. A mat is less expensive than a stereotype and will reproduce your advertisement equally as well.

When you send them a mat instead of an electro there is one more duplication for the newspapers to make in producing the final stereotype from which they print, but the mat which your plate-maker furnishes them is at least molded directly from the original plate, so that it is sharper and deeper than the mat the newspapers have to make when you furnish them a stereotype from which to work. When you furnish the large dailies with the mat they cast a flat stereotype first, which is locked up in the form with the other matter composing the page. This entire form is then molded into a mat and stereotyped.

The small dailies and country newspapers print directly from type and cuts. They use a flat-bed press. For this reason it is necessary that the advertising-plate or dealers cut which you furnish to them should be mounted type-high.

The best plate you can furnish them is none too good; their make-ready and the general handling of their material is not of the highest order in efficiency as compared to the large dailies, and it is entirely probable that even with a good sharp electrotype, your advertisement may not show to advantage. With a stereotype, the liability of smudgy printing is greatly enhanced.

The Rapid Electrotype Company knows the mechanical equipment of the different newspapers throughout the United States. It sends mounted plates to those papers that print directly from type and cuts, and unmounted plates to those that stereotype their forms.

This detail is left entirely to their discretion. The names of the towns to which your advertisement or dealers-cut is to be shipped is all the information they require in order to determine whether or not to ship mounted or unmounted plates.

THE RAPID ELECTROTYPE COMPANY

THE RAPID ELECTROTYPE COMPANY of Cincinnati was organized in July, 1899, and incorporated under the laws of Ohio in May, 1902. It has been in service over a fifth of a century.

Prior to the organization of The Rapid Electrotype Company, electrotyping was, on the whole, a localized business. The Rapid Electrotype Company pioneered in the service of making and distributing newspaper advertising plates—electrotypes, aluminotypes, stereotypes, and mats—direct from its factory in Cincinnati to newspapers and dealers throughout the United States.

The originality of this service, intelligently rendered to advertising agencies and advertisers, was one of the reasons for the increase of their capacity from only five thousand square inches of plate matter daily in 1899 to one million square inches per day in 1921, and from an organization of only nine men to one of over two hundred and fifty, working in day and night shifts.

Their new factory is unquestionably the largest of its kind in the world, especially designed and equipped for the making and distribution of newspaper ad plates of all kinds. Over forty-five thousand square feet of floor space is devoted to this service, and with their highly

developed co-operative facilities they occupy a unique place in the advertising plans of many large national advertisers and advertising agencies.

FACTORY PRACTICE

Developing and serving an ever increasing volume of business has brought about a specialization in the factory practice of The Rapid Electrotype Company. It has kept pace with the demands upon its production and has made improvements in manufacturing methods designed to cut-corners in cost of manufacture, to be shared with its customers, and to make its service truly Rapid for all emergencies, without sacrificing quality.

Its commercial job-plate department is a separate and distinct unit from the newspaper advertising-plate department.

The character of the respective requirements of commercial job-plates and newspaper advertising plates make this departmental production advisable.

A lead-molding press, built by The F. Wesel Mfg. Co., weighing over thirty-thousand pounds, and developing two thousand tons pressure per square inch on a thirty inch hydraulically operated ram is used in the job-plate department. On this press are duplicated, from the finest screen half-tones, the highest quality electrotypes and nickeltypes to be used in three and four color process printing.

The preponderating volume of its business, however, is the production of newspaper electrotypes, and it is in this department that The Rapid Electrotype Company has made distinct improvements in manufacturing practice by methods and machinery designed and constructed by its own engineers in its own machine shop.

BLACK LEADING

The Rapid Electrotype Company has built a new type of machine for use in this important phase of the electrotyping art. It is a combination Dry-Wet Machine, designed by its own engineering staff.

Those familiar with electrotypes well know the superiority of the wet black leading process, especially for half-tones, stipple, Ben Day or fine type, where much of the detail and sharpness is lost in dry black leading, because of the crushing effect the brushes have on the wax mold. In this new type of black leading machine this fault is entirely eliminated, as the brushes never come in contact with the printing face of the mold; they merely polish the high built-up spots, thereby insuring better electrical conductivity to the wax, and a more uniform deposition of the copper shell.

Two of these especially designed machines are in constant operation in the ad department, which means the highest grade of advertising plates.

DEPOSITING THE SHELL

Those who are not technically familiar with electrochemistry are prone to think that the length of time a mold is kept in the electrolytic bath, i. e., the copper bath, determines the thickness of the shell deposited thereon. As a matter of fact, one electrotyper may keep his molds in the copper bath for three hours and get only as thick a shell as another who keeps his in but two hours. The element of time does not determine the thickness nor quality of the shell deposited.

The determining factors in this phase of electrotyping are the composition of the electrolytic bath, its temperature, and the current density applied. In addition,

the purity of the materials, the cleanliness of the batteries, the perfection of the electrical connections as well as the distance between the anode and the cathode are all matters of importance. These factors are all variables and must be confined between narrow limits.

This important phase of manufacture in The Rapid Electrotype Company is under the supervision of an electro-chemical engineer.

Plus this fact is the accuracy of mechanical operation in handling wax molds from the time they are put into the batteries until they are taken out with the shell deposited thereon and ready for tinning and backing-up.

The molded cases are suspended at regular intervals of twenty inches from an endless chain-conveyor operating directly over the batteries. This conveyor carries the cases edge-wise through the electrolytic bath between two rows of anodes which are four inches apart. At the end of each battery the conveyor automatically lifts the cases out and over into the next battery in the series, of which there are seven. The eighth tub contains pure running water for washing the case after the complete deposition of the shell.

The speed of this conveyor is regulated so that when the molded case has reached the end of its journey through the series of seven batteries, the other factors also being regulated, a shell of uniform thickness and texture throughout is deposited thereon.

This automatic handling of the cases in the batteries eliminates the necessity of the battery-man pulling the case out of the bath by hand from time to time in order to peel back a corner of the shell to see if it is thick enough, which is the common practice. In other words,

the element of human guess-work is eliminated, and in addition, the items of time and handling are greatly reduced.

BACKING UP THE SHELL

Backing-up the shells with the metal base, i. e., casting, is done automatically by The Rapid Electrotype Company.

A rotary casting-table with a capacity of ten pans revolves around its axis on a plane that brings each pan immediately below a spout through which the required metal is automatically flowed from the bottom of the metal pot on the tinned shell placed therein. When the required metal backing has been flowed, the table turns to bring the next pan with its shell under the metal-spout. The amount of metal flowed is exactly regulated. As the casting table completes a circuit, the first shell backed up has cooled so that it can be removed to the scrubbing machine.

This method, of course, eliminates the hand-ladling of hot metal from the metal-pot to the casting-table, as is the ordinary practice, and obviates any possibility of the oxidized metal or dross on the surface getting into the casts, besides effecting a marked economy in time and handling. In addition, it casts the plates flat, thereby eliminating about 75 per cent of the finishing, which, of course, means a better printing plate. Three of these machines are used.

The Rapid Electrotype Company developed and built these casting-machines in its own machine shop and owns the patents covering them.

THE ALUMINOTYPE PROCESS

The development, perfection and introduction of the Aluminotype Process for duplicating a printing surface

in a solid piece is one of the outstanding accomplishments of The Rapid Electrotype Company, and marks a distinct step in advance of the other and older methods used in the graphic arts, for certain classes of printing.

Aluminotypes are much harder than an electrotype or stereotype and have as sharp and deep a printing face as an electrotype. The Aluminotype process will reproduce as sharp and clear as the electrotyping process an eighty line screen half-tone, which is really too fine a screen for newspaper printing.

A distinct advantage Aluminotypes have is in the item of weight. An Aluminotype, unmounted, weighs only one quarter as much as an unmounted electrotype or stereotype of the same size. When mounted on a wood base an Aluminotype weighs just one half as much as an electrotype or stereotype of the same size mounted on wood. In a national advertising campaign where a general list of newspapers is used Aluminotypes, by reason of their light weight, effect a marked saving in parcel-post or express charges. This saving in postage is especially noticeable in the case of foreign country newspaper campaigns.

In addition, because of their toughness, a saving can be made in packing Aluminotypes, inasmuch as they do not require the expensive precautions in packing to avoid injury in transportation that electrotypes or stereotypes do. They will not bend; their printing face cannot be injured by the ordinary mishaps attendant upon handling in transportation. For all practical purposes it can be said that Aluminotypes are indestructible.

MATRICES

The ordinary practice followed in making mats is to use an electrotype or stereotype pattern plate made

from the original form. Sometimes the original itself is used.

The first mat molded from an electrotype pattern plate will be sharp. The next one molded will be a little less sharp than the first. The third one molded will be slightly less sharp than the second one. In other words, with every succeeding mold, the electrotype or stereotype pattern plate is mashed a little by the pressure of the matrix press until it has to be discarded and a new one used.

The five-thousandth mat made by the Rapid Electrotype Company from the same pattern plate is as sharp as the first one molded. This is because an *aluminotype* pattern is used from which to mold. *Aluminotypes* will not mash under the pressure of the matrix press, as they are much harder than electrotypes.

THE SHIPPING DEPARTMENT

The shipping department of The Rapid Electrotype Company is one of the most important and highly systematized in the entire organization, and in the manner of handling orders for distribution to newspapers in large campaigns or in making bulk shipment direct to the advertisers is unique.

It is in this department that the packing and routing of advertising plates to newspapers or dealers is done. A system of triple checking each item of all orders precludes, as far as is humanly possible, any error in filling accurately all specifications.

This brochure was compiled
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